

## SOME LAELAPINE PARASITES OF AUSTRALASIAN MAMMALS (ACARI: DERMANYSSIDAE)

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### ABSTRACT

Twenty-one species in six genera of laelapine mites, mostly from the Kimberley, Western Australia, are listed: *Mesolaelaps* (two species), *Haemolaelaps* (five), *Androlaelaps* (one), *Laelaps* (10, including four new ones from murine rodents: *L. elegans* from *Pseudomys* spp., *L. synnomus* from *Zyzomys argurus*, *L. parameces* from *Conilurus penicillatus* and *L. angiodes* from *Z. woodwardi*), *Neolaelaps* (one) and *Trichosuroaelaps* (two).

### INTRODUCTION

This contribution to our knowledge of Western Australian ectoparasites collected by Dr F.S. Lukoschus, Catholic University, Nijmegen, treats the various laelapine mites from mammals (for completeness' sake, I have incorporated data from a few other slides, mostly with Western Australian Museum labels). Current papers on the group in Australia are more concerned with the fauna of the eastern states (Domrow 1973, 1977, 1979).

The term "holotrichous" refers to the setal condition in typical free-living dermanyssids (Evans & Till 1965, Evans 1969). Hosts are given after Ride (1970). Numbers in the 2-3000s are Dr Lukoschus' field numbers for the hosts. Depositories for mites are abbreviated: WAM Western Australian Museum, Perth; FMNH Field Museum of Natural History, Chicago; QIMR Queensland Institute of Medical Research, Brisbane; CU Catholic University, Nijmegen; ANIC Australian National Insect Collection, CSIRO, Canberra; MNK Museum für Naturkunde an der Humboldt-Universität, Berlin; RMNH Rijksmuseum van Natuurlijke Historie, Leiden; ZMH Zoologisches Institut und Zoologisches Museum der Universität, Hamburg.

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## DESCRIPTION OF MATERIAL

### *Mesolaelaps australiensis* (Hirst, 1926)

This species is widespread throughout Australia and adjacent territories (Domrow 1979). *Notomys alexis* and *Pseudomys nanus* are added to its equally wide range of hosts.

#### *Hosts and Localities*

On brindled bandicoot, *Isodon macrourus* (Gould) (Marsupialia: Peramelidae) (3150), Port Warrender, W.A., 31.X.1976 (7 ♀♀). In WAM, FMNH, QIMR, CU.

On Tunney's rat, *Rattus tunneyi* (Thomas) (Rodentia: Muridae) (2679), Mount Hart, W.A., 10.IX.1976 (8 ♀♀). On *R. tunneyi* (3140), Port Warrender, 30.X.1976 (3 ♀♀, 1 ♂). In WAM, FMNH, QIMR, CU.

On spinifex hopping mouse, *Notomys alexis* Thomas (Muridae) (M12964), Wanjarri Nature Reserve, W.A., 8.I.1975, P. Lambert (1 ♀). In WAM.

On western chestnut native mouse, *Pseudomys nanus* (Gould) (Muridae) (3030), Mitchell Plateau, W.A., 20.X.1976 (1 ♀). In WAM.

On scale-tailed rat, *Melomys* sp. (Muridae) (3140, 3141), Port Warrender, 30.X.1976 (3 ♀♀). In WAM, FMNH, QIMR.

### *Mesolaelaps antipodians* (Hirst, 1926)

This species is common on bandicoots in east and south-east Australia, including Tasmania (Domrow 1963, 1977), but was previously unknown from *Isodon auratus* and Western Australia. The specimen from *Antechinus macdonnellensis* is best regarded as a straggler. The dorsal shield of this species has not previously been described.

Female (**Fig. 1**): Dorsal shield 900-915  $\mu\text{m}$  long, 670-690  $\mu\text{m}$  wide; as characteristic (broadly drop-shaped, with truncate termen) as that of *M. sminthopsis* (Womersley) (see Domrow 1977); surface granulate, with very weak reticulate striae marginally from vertex to posterolateral angles; holotrichous (with 22 pairs of setae on podonotal portion, 17 on opisthonotal;  $J_4$  widely set and  $J_5$  displaced to termen, thereby leaving large quadrate expanse between their bases bare), lacking only one pair of pores (that behind  $j_4$ ) of 22 pairs figured by Evans & Till (1965) for *Laelaps* Koch.

#### *Hosts and Localities*

On golden bandicoot, *Isodon auratus* (Ramsay) (Marsupialia: Peramelidae) (M7181), Barrow Island, W.A., 29.V.1964, W.H. Butler (9 ♀♀). In WAM, FMNH, QIMR, CU.

On red-eared marsupial mouse, *Antechinus macdonnellensis* (Spencer) (Marsupialia: Dasyuridae) (M8938), Warburton Range, W.A., 6.VIII.1967, A.M. Douglas (1 ♀). In WAM.



Fig. 1: *Mesolaelaps antipodianus* (Hirst). Dorsal shield ♀. (All scales = 100  $\mu$ m.)

### *Haemolaelaps casalis* (Berlese, 1887a)

This widespread associate of vertebrates and their nests is known from the south-west Pacific and south-east Australia, but not from Western Australia (Womersley 1956, Wilson 1967, Domrow 1973). The question of its synonymy with *H. fenilis* (Méglin) remains unresolved (Strandtmann 1963, Evans & Till 1966).

### *Host and Locality*

On common rock rat, *Zyzomys argurus* (Thomas) (Rodentia: Muridae) (3117), Port Warrender, W.A., 29.X.1976 (1 ♀). In WAM.

### *Haemolaelaps marsupialis* (Berlese, 1910)

This species is common on bandicoots in eastern Australia, including Tasmania (Keegan 1956, Domrow 1963), but was previously unknown from *Isoodon auratus* and Western Australia.

### *Host and Locality*

On golden bandicoot, *Isoodon auratus* (Ramsay) (Marsupialia: Peramelidae) (M7181), Barrow Island, W.A., 29.V.1964, H.W. Butler (2 ♀♀). In WAM.

### *Haemolaelaps domrowi* Womersley, 1958

This species is common on bandicoots in New Guinea and eastern Australia, including Tasmania (Domrow 1961, 1979), but was not previously known from Western Australia. The deutonymph was previously unknown. The specimens from *Rattus tunneyi* are best regarded as stragglers.

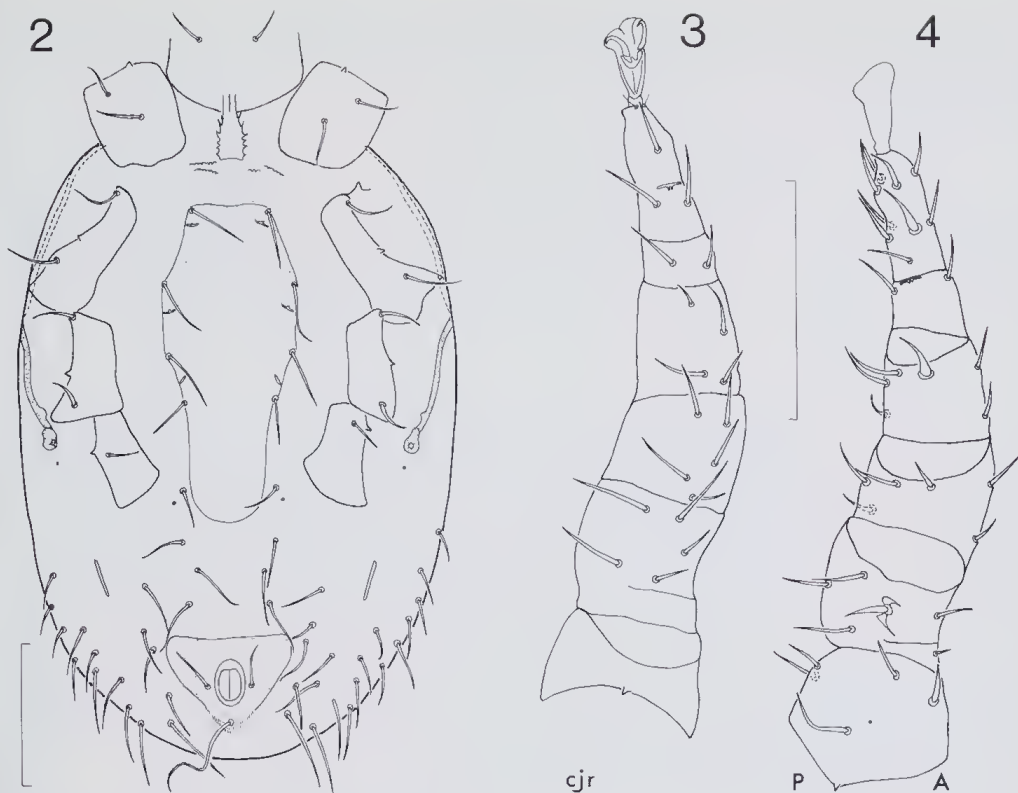
Femur II, even among the same series, may show seta *av* associated with a low, bilobed prominence. Correlated with this, seta *av* on genu-tibia II and *av*<sub>2</sub> on tarsus II may be flared basally.

Deutonymph (Figs 2-4): Freshly moulted and pale, but capitulum essentially as in ♀.

Dorsal shield 445-470 µm long, lateral margins not especially clear, but certainly incised between podonotal and opisthonotal portions. Dorsum otherwise as in ♀.

Some presternal striae spinulose. Sternogenital shield 215-225 µm long, 90-95 µm wide at level of second pair of sternal setae (*st*<sub>2</sub>); posterior margin broadly ligulate; surface with a few reticulate striae anterolaterally; with usual four pairs of setae and three pairs of pores; genital setae (*g*) and pores free in adjacent cuticle. Anal shield 60-65 µm long, *ca* 80 µm wide. Ventral cuticle with about 20 pairs of setae of increasing length posteriorly. Venter otherwise as in ♀, except that poststigmatic pores are free in cuticle.

Leg setation holotrichous, predicting that of ♀ noted above [but note that Till (1963) found genu IV in Ethiopian species of *Androlaelaps* Berlese—taken to include *Haemolaelaps* Berlese—to bear one additional seta (*pl*<sub>2</sub>), *i.e.* 2-5/1-2].



Figs 2-4: *Haemolaelaps domrowi* Womersley. 2, Idiosoma dn (ventral). 3-4, Leg II dn (dorsal, and ventral and lateral).

#### *Hosts and Locality*

On brindled bandicoot, *Isoodon macrourus* (Gould) (Marsupialia: Peramelidae) (3150), Port Warrender, W.A., 31.X.1976 (12 ♀♀, 4 ♂♂, 1 dn, 1 pn). In WAM, FMNH, QIMR, CU.

On Tunney's rat, *Rattus tunneyi* (Thomas) (Rodentia: Muridae) (3112, 3140), Port Warrender, 29, 30.X.1976 (5 ♀♀, 1 ♂, 1 dn, 1 pn). In WAM, FMNH, QIMR, CU.

#### *Haemolaelaps hattenae* Domrow, 1963

The only known records of this species are from rat kangaroos: *Aepyprymnus rufescens* in Queensland and *Bettongia gaimardi* (Desmarest) in Tasmania (Domrow 1963, 1972a).

#### *Hosts and Localities*

On rufous rat kangaroo, *Aepyprymnus rufescens* (Gray) (Marsupialia: Macropodidae), Tooloom, N.S.W., 14.XI.1961, J.H. Calaby (2 ♀♀). In QIMR.

On brush-tailed rat kangaroo, *Bettongia penicillata* (Gray) (Macropodidae), Manjimup, W.A., 19.XII.1977, G. de Chaneet (1 ♀). In QIMR.

### *Haemolaelaps quartus* Domrow, 1961

The only known records of this species are from the rat kangaroo *Aepyprymnus rufescens* in S.E. Queensland and adjacent New South Wales (Domrow 1963, 1972a).

#### *Hosts and Localities*

On rufous rat kangaroo, *Aepyprymnus rufescens* (Gray) (Marsupialia: Macropodidae), Byfield, Q., 28.I.1964, R.K. Norton (1 ♀). On *A. rufescens*, Inkerman, 11 km S of Home Hill, Q., 16.VIII.1972, P. Ferris (4 ♀♀). In QIMR.

On brush-tailed rat kangaroo, *Bettongia penicillata* (Gray) (Macropodidae), Manjimup, W.A., 19.XII.1977, G. de Chaneet (1 ♀). In QIMR.

### *Androlaelaps hermaphroditus* (Berlese, 1887b)

This associate of vertebrates and their nests is widespread in the south-west Pacific and east Australia, but was previously unknown from Western Australia (Womersley 1956, Wilson 1967, Domrow 1977).

#### *Host and Locality*

On common rock rat, *Zyzomys argurus* (Thomas) (Rodentia: Muridae) (3059), Mitchell Plateau, W.A., 22.X.1976 (1 dn). In WAM.

### *Laelaps nuttalli* Hirst 1915

This cosmopolitan species is widespread on many species of *Rattus*—including *R. tunneyi*—and *Melomys* in Australasia, but was previously unknown from Western Australia (Allred 1969, Marshall 1976, Ramsay 1977, Ramsay & Paterson 1977, Domrow 1979).

#### *Hosts and Localities*

On Tunney's rat, *Rattus tunneyi* (Thomas) (Rodentia: Muridae) (2679), Mount Hart, W.A., 10.IX.1976 (4 ♀♀). On *R. tunneyi* (3099, 3101, 3112), Mitchell Plateau, W.A., 28, 29.X.1976 (14 ♀♀, 20 ♂♂, 22 dn, 3 pn). On *R. tunneyi* (3116, 3140), Port Warrender, W.A., 29, 30.X.1976 (1 ♀, 2 ♂♂). In WAM, FMNH, QIMR, CU.

On scale-tailed rat, *Melomys* sp. (Muridae) (3140, 3141), Port Warrender, 30.X.1976 (33 ♀♀, 14 ♂♂, 4 pn). In WAM, FMNH, QIMR, CU.

## *Laelaps assimilis* Womersley, 1956

This species is common on *Rattus fuscipes* and *R. lutreolus* (Gray) throughout their ranges (Domrow 1977). The following specimens are included for historical reasons.

### *Host and Locality*

On southern bush rat, *Rattus fuscipes* (Waterhouse) (Rodentia: Muridae) (20359), Australia, 1869, S. de Hambourg (1 ♀, 1 dn). In RMNH.

## *Laelaps elegans* sp. nov.

*L. nuttalli* Domrow, 1979 *partim* (1 ♀ from *Pseudomys gracilicaudatus*).

The original female I studied keyed out to *L. nuttalli* in Domrow (1965) and Allred (1969), despite small differences (*e.g.* seta *av* on coxa I basally expanded; outline of genitoventral shield extended posteriorly well beyond concave stria between third pair of usurped ventral setae, truncate rather than softly curved; anterior margin of anal shield concave). However, the long series now listed quickly showed that these differences in the female, subtle though they be, were not only constant, but also supported by a striking difference in the male: in the new species, the holovenral shield is so narrow behind coxae IV as to leave the metapodal shields well clear in the cuticle (fused into holovenral shield in *L. nuttalli*).

The normal hosts of the new species seem to be species of *Pseudomys* (the four specimens from *Rattus tunneyi* and *Zyzyomys argurus* are best regarded as stragglers). *L. nuttalli* is common in Australia on certain species of *Rattus*.

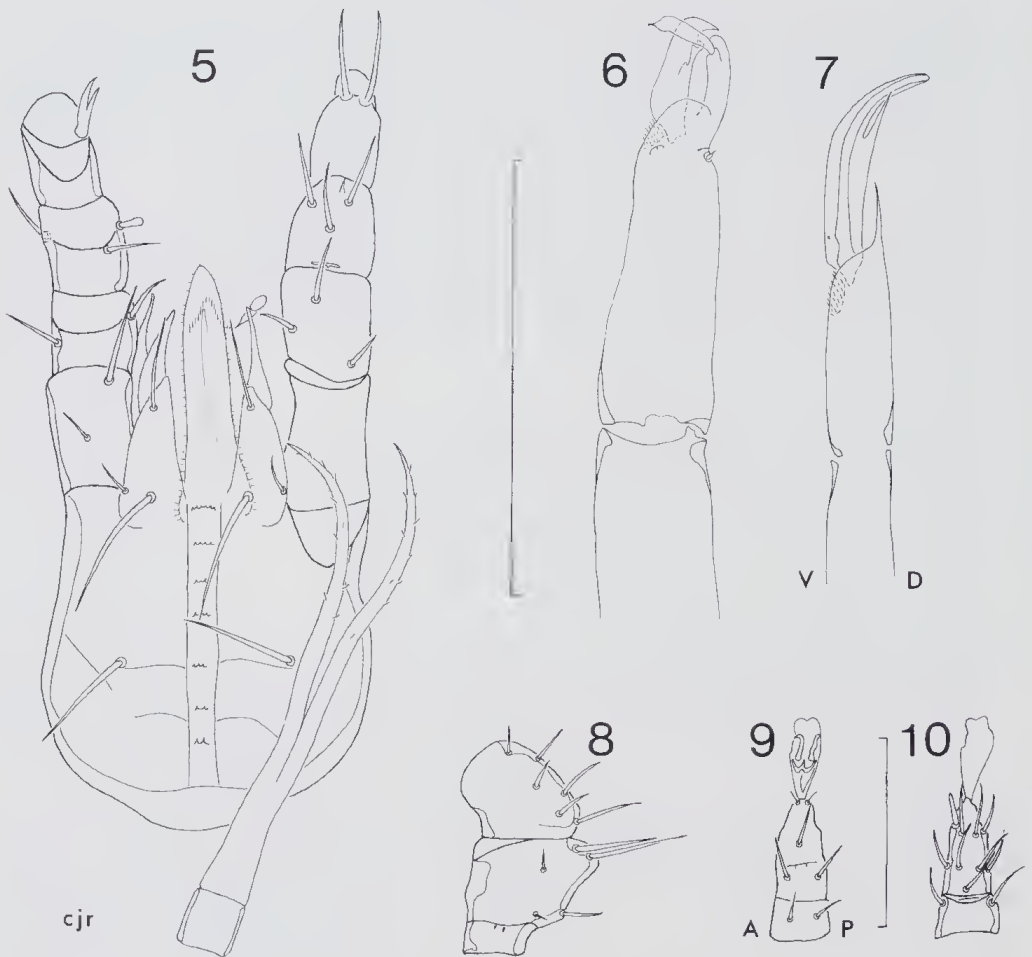
The new specific name is the Latin adjective *elegans* (fine, neat), and refers to seta *av* on coxa I.

A full description of the first new species will allow a briefer, comparative treatment of the other three.

Female (Figs 5-6, 8-14): Epistome a broad, hyaline, inverted U reaching to level of apices of palpal femora. Basis capituli longer than wide; setae *c* reaching beyond opposite edge of deutosternum (which bears seven short rows of denticles). Hypostome with setae  $h_3 > h_1 > h_2$ . Internal malae a ciliated median triangle flanked on either side by lobate process, *cf.* *Haemolaelaps ulysses* Domrow, 1961. Cornicles of normal length, but slender and weakly sclerotised. Salivary stylets present. Labrum hastate, spiculate marginally, grooved medially, Palpi holotrichous (trochanter-tibia 2.5.6.14, including two dorsodistal rods on tibia; tarsus with usual few slender ventral setae and cluster of terminal rods); claw bifid. Chelicerae 135-145  $\mu\text{m}$  long overall, with digits occupying 20% of total length; shaft bearing usual setule, two pores and

small corona; fixed digit edentate, with pilus dentilis strongly inflated, apically spined, projecting outwardly between two external teeth on movable digit; latter also with one subterminal tooth on margin in addition to sharp tip.

Dorsal shield 450-505  $\mu\text{m}$  long, 280-305  $\mu\text{m}$  wide; ovate, evenly rounded in posterior third, with very narrow strip on margin pale; surface with reticulate striae; holotrichous (with 22 pairs of setae on podonotal portion, 17 on opisthonotal), with usual 22 pairs of pores [lyriform outside setae  $z_1$  and  $Z_5$ , others ranging from punctate to small crateriform; none with surrounding "window," i.e. obvious area of thinned cuticle, as in *L. hapaloti* Hirst, see Domrow (1973)]. Dorsal cuticle with about 13 pairs of setae of increasing length posteriorly.



**Figs 5-10:** *Laelaps elegans* sp. nov. 5, Capitulum and tritosternum ♀ (ventral, with true left palp dorsal). 6-7, Chelicerae ♀ and ♂ (dorsoexternal). 8, Femur-genu I ♀ (dorsal). 9-10, Tarsus II ♀ (dorsal, and ventral and lateral).



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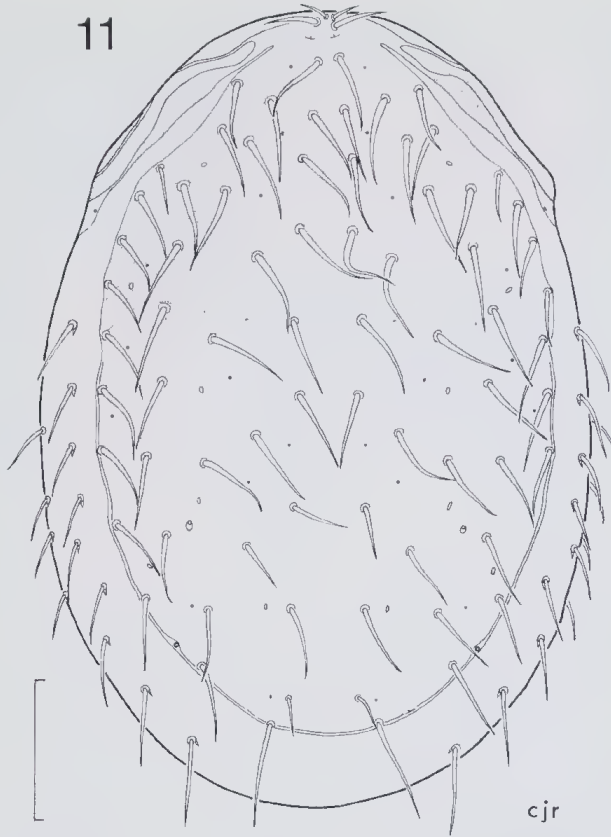
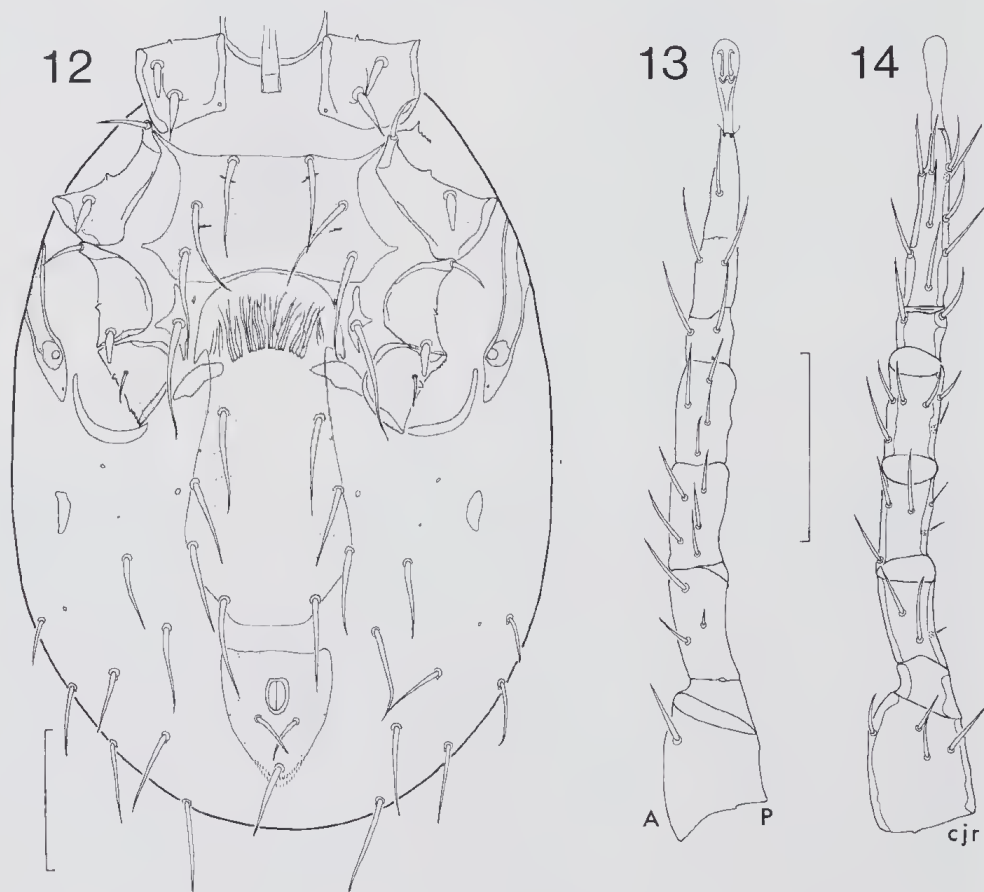


Fig. 11: *Laelaps elegans* sp. nov. Idiosoma ♀ (dorsal, seta  $S_3$  absent on right-hand side).

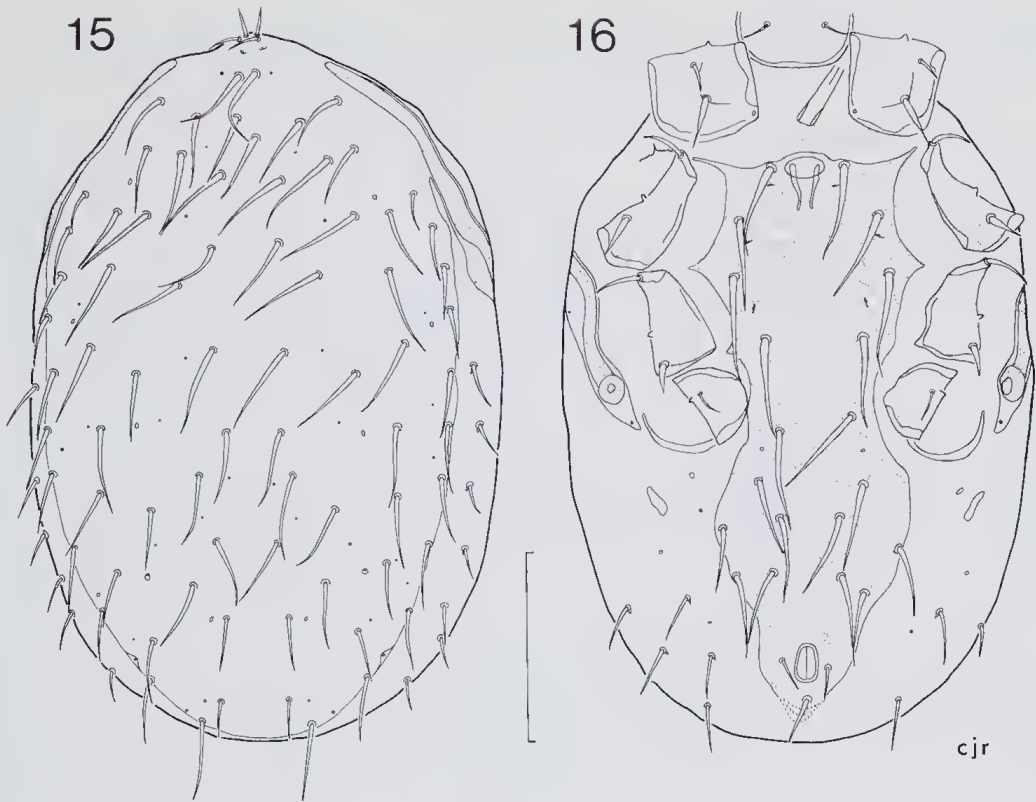
Tritosternum with base unarmed; laciniae slender, lightly ciliated. Presternal area with transverse striae. Sternal shield shorter in midline (70-75  $\mu\text{m}$ ) than wide at level of second pair of sternal setae ( $st_2$ ) (120-130  $\mu\text{m}$ ); anterior margin straight, posterior margin slightly concave; surface with reticulate striae; with usual three pairs of sternal setae ( $st_{1,3}$ ) and two pairs of sternal pores. Metasternal setae ( $mst$ ) set on metasternal shields whose posterior points project freely from cuticle, metasternal pores free in cuticle. Genitoventral shield elongate, only slightly expanded behind coxae IV, much longer behind genital setae ( $g$ ) (140-150  $\mu\text{m}$ ) than maximum width (110-120  $\mu\text{m}$ ); posterior margin distinctly drawn out behind third pair of usurped ventral setae ( $v_3$ ), truncate; surface with transverse striae; with usual four pairs of setae ( $g, v_{1,3}$ ) and pair of genital pores; operculum rayed, supported by genital apodemes between coxae IV, reaching forward in even curve to posterior margin of sternal shield. Anal shield longer in midline (85-95  $\mu\text{m}$ , including cribrum) than maximum width (70-75  $\mu\text{m}$ ); anterior margin slightly concave; surface with reticulate striae marginally; with usual

pair of adanal setae (*aa*), postanal seta (*pa*) and pair of anal pores (*aa* barely reaching insertions of stronger *pa*). Metapodal shields present. Ventral cuticle with some paired plaquettes and pores, and about eight pairs of setae of increasing length posteriorly. Peritremes reaching forward almost to level of anterior margins of coxae I; peritrematic shields fused vertically to dorsal shield, but free posteriorly of crescentic expodal shields IV.

Leg setation holotrichous, with one exception: genu IV with one additional seta (*pl*<sub>2</sub>), i.e. 2-5/1-2 as often in *Laelaps*, e.g. *L. echidninus* Berlese. Coxae with a few short striae; I with *av* somewhat swollen basally, attenuate distally; I-III with *pv* strengthened and blunt, i.e. spur-like (II also with small spinose process on anterodorsal margin). Femora I-II with both *ad*<sub>1</sub> and *pd*<sub>1</sub> elongate. Genua I with *pd*<sub>3</sub> and II with *pd*<sub>2</sub> elongate. Tarsi II-III with *al*<sub>1</sub> spur-like, but not to extent of *pv* on coxae I-III. Tarsus I with dorsodistal sensory islet.



**Figs 12-14:** *Laelaps elegans* sp. nov. 12, Idiosoma ♀ (ventral). 13-14, Leg IV ♀ (dorsal, and ventral and lateral).



Figs 15-16: *Laelaps elegans* sp. nov. Idiosoma ♂ (dorsal and ventral).

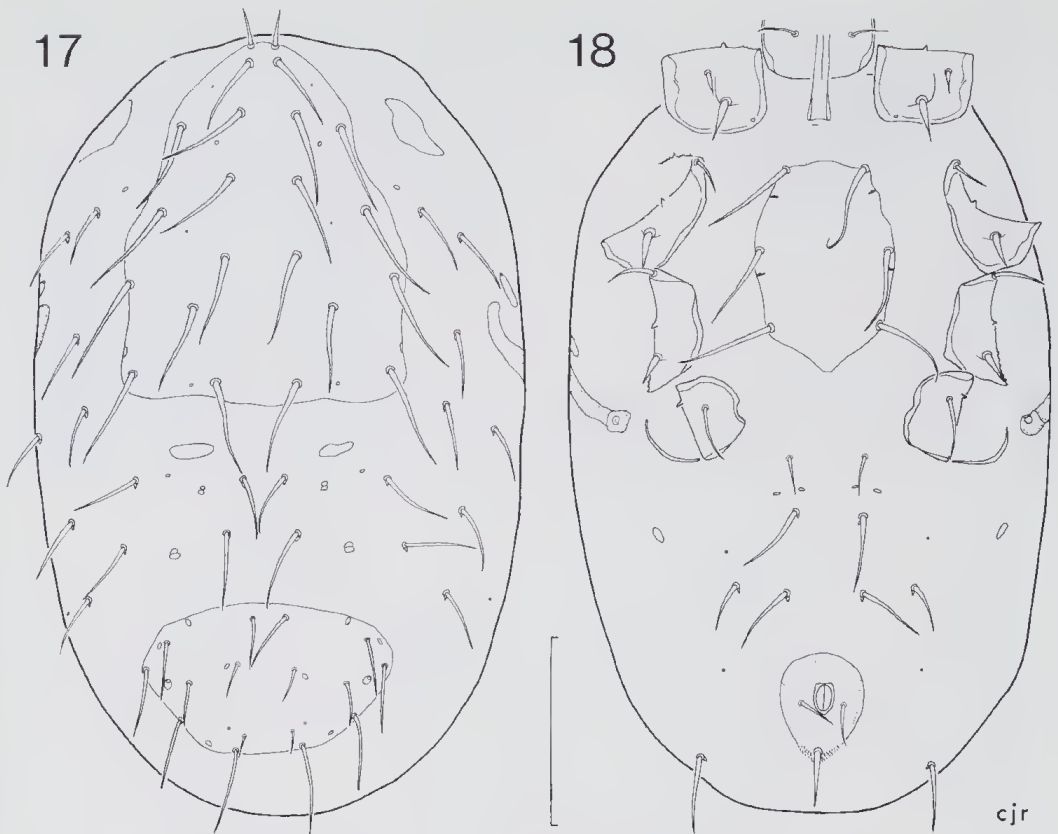
Male (Figs 7, 15-16): Capitulum as in ♀, except for secondary sexual characters of chelicerae. Fixed digit obsolescent. Spermatodactyl occupying 45% of total length (105-115  $\mu\text{m}$  overall), almost obliterating movable digit.

Dorsal shield with reticulate striae as in ♀, 345-400  $\mu\text{m}$  long, 210-235  $\mu\text{m}$  wide. Dorsal cuticle with about six pairs of subequal setae.

Venter as in ♀, except as follows. Holoventral shield 290-330  $\mu\text{m}$  long, with ventral portion only slightly expanded behind coxae IV (95-115  $\mu\text{m}$  wide), bearing usual five pairs (at times 5/4) of ventral setae, but leaving metapodal shields quite free in cuticle. Ventral cuticle with about four pairs of subequal setae. Peritrematic shields fused humerally to dorsal shield.

Legs as in ♀, except as follows. Coxae I with *pv* almost setiform, sharp-tipped, II-III with *pv* sharp-tipped. Genu II with *pd*<sub>2</sub> hardly elongate. Tarsi II-III with *al*<sub>1</sub> sharp-tipped.

Protonymph (Figs 17-18): Capitulum as in ♀, except as follows. Palpi holotrichous (trochanter-tibia 1.4.5.12, including two dorsodistal rods). Chelicerae 85-105  $\mu\text{m}$  long.



Figs 17-18: *Laelaps elegans* sp. nov. Idiosoma pn (dorsal and ventral).

Podonotal shield 170-200  $\mu\text{m}$  long, 135-155  $\mu\text{m}$  wide (larger specimens presumably prefemale); sinuous laterally, shallowly trilobate posteriorly; surface with reticulate striae; holotrichous (with 11 pairs of setae), with five pairs of obvious pores. Opisthonotal shield 70-80  $\mu\text{m}$  long, 110-130  $\mu\text{m}$  wide; slightly rounded anteriorly, three-sided posteriorly; surface with reticulate striae; holotrichous (with eight pairs of setae), with six pairs of distinct pores. Three pairs of mesonotal shieldlets present. Dorsal cuticle holotrichous (with five pairs of podonotal setae and six opisthonotal), with some paired plaquettes and pores.

Venter as in ♀, except as follows. Sternal shield 95-110  $\mu\text{m}$  long, 65-80  $\mu\text{m}$  wide; slightly convex laterally, angulate posteriorly; surface with reticulate striae; with usual three pairs of setae and two pairs of pores. Anal shield 50-60  $\mu\text{m}$  long, 35-45  $\mu\text{m}$  wide; with minimal striae. Ventral cuticle with five pairs of setae, anteriormost pair shortest. Peritremes abbreviated, falling short of anterior margins of coxae III, with peritrematic shields in two fragments on dorsum (these representing two dorsal expansions of entire shields in ♀ in Fig. 11).

Leg setation holotrichous, with one exception: genu IV with one additional seta ( $pl_1$ ), i.e. 1-4/0-1. Setae as in ♂ (including  $pv$  on coxae I-III,  $ad_1$  and  $pd_1$  on femora I-II,  $pd_2$  on genua I-II, and  $al_1$  on tarsi II-III).

#### *Hosts and Localities*

On western chestnut native mouse, *Pseudomys nanus* (Gould) (Rodentia: Muridae) (3004, 3007, 3014, 3029, 3030, 3039, 3040, 3045, 3048, 3050, 3051, 3054, 3062, 3065, 3091, 3092, 3093, -), Mitchell Plateau, W.A., -, 18-25.X.1976 (holotype ♀, allotype ♂, 83 paratype ♀♀, 73 paratype ♂♂, 131 morphotype pn). In WAM (including holotype 79/1434, and allotype 79/1435), FMNH, QIMR, CU.

On Forrest's native mouse, *Pseudomys forresti* (Thomas) (3063), Mitchell Plateau, 22.X.1976 (3 ♀♀, 1 pn, not types). In WAM, FMNH, QIMR, CU.

On eastern chestnut native mouse, *Pseudomys gracilicaudatus* (Gould), 98 km NW of Bundaberg (24°31'S, 151°28'E), Q., 10.I.1975, A.C. & J.F. Robinson (1 ♀, not a type). In ANIC.

On Tunney's rat, *Rattus tunneyi* (Thomas) (Muridae) (3140), Port Warrender, W.A., 30.X.1976 (1 ♂, not a type). In WAM.

On common rock rat, *Zyzomys argurus* (Thomas) (Muridae) (2809), Brooking Springs, W.A., 29.IX.1976 (1 ♂, not a type). On *Z. argurus* (3037), Mitchell Plateau, 20.X.1976 (2 ♀♀, not types). In WAM, FMNH, QIMR.

#### *Laelaps synnomus* sp. nov.

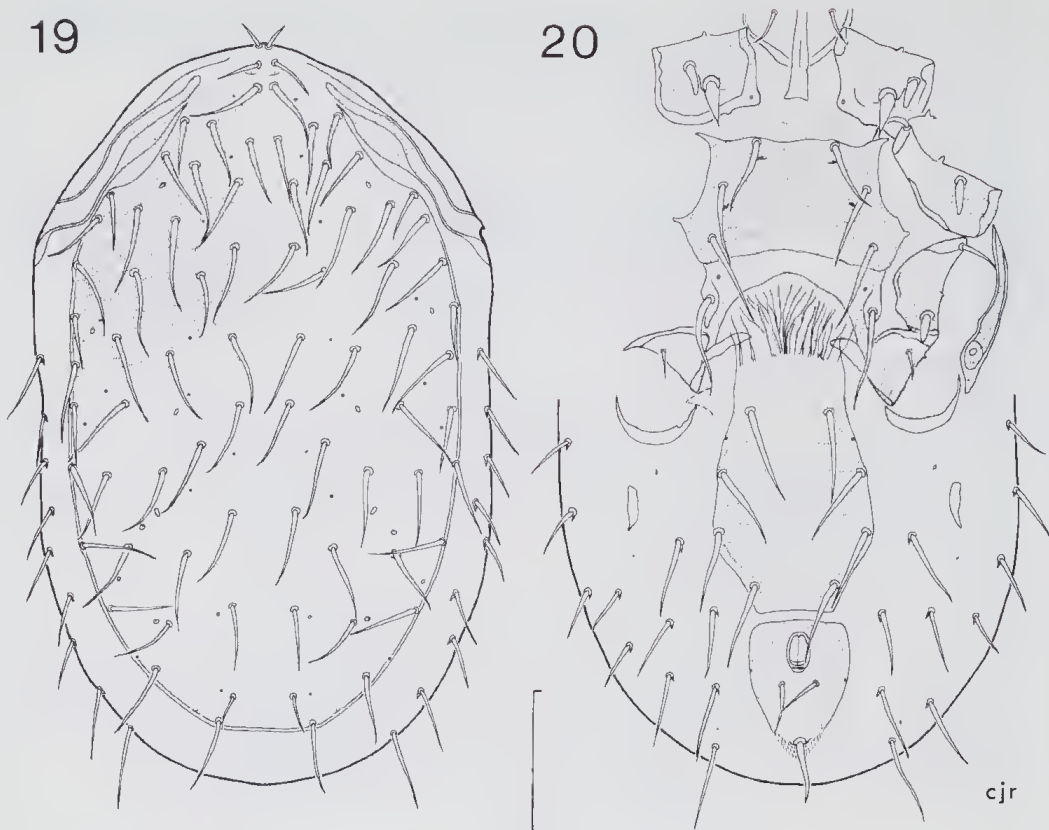
Accepting that both setae on coxa I are spur-like, the new species keys out near *L. wasselli* Domrow both in Domrow (1965) and Allred (1969). Apart from its much smaller size (dorsal shield 460-505  $\mu\text{m}$  long in *L. synnomus*, 735-755  $\mu\text{m}$  in *L. wasselli*), the new species is further separable from *L. wasselli* by the extended posterior margin and narrower proportions of the genitoventral shield (ratio L/B 1.15 v. 1.00).

The normal host seems to be *Zyzomys argurus*. The two specimens from *Rattus tunneyi* are best regarded as stragglers. *L. wasselli* is restricted to *Hydromys chrysogaster* Geoffroy (Muridae).

The new specific name is the Greek adjective συννομος (feeding together, gregarious), and refers to the presence on *Zyzomys* of other species of *Laelaps*.

**Female (Figs 19-20):** Chelicerae 130-135  $\mu\text{m}$  long, with digits occupying 20% of length; movable digit with only two external teeth in addition to sharp tip. Capitulum otherwise as in *L. elegans*.

Dorsal shield 460-505  $\mu\text{m}$  long, 250-305  $\mu\text{m}$  wide (smallest specimens pale and freshly moulted); not so roundly ovate as in *L. elegans*. Dorsum otherwise as in *L. elegans*, except that cuticle bears only about nine pairs of setae.



Figs 19-20: *Laelaps synnomus* sp. nov. Idiosoma ♀ (dorsal and ventral).

Sternal shield 75-80  $\mu\text{m}$  long, 125-135  $\mu\text{m}$  wide. Genital shield 125-140  $\mu\text{m}$  long, 105-125  $\mu\text{m}$  wide. Anal shield 85-95  $\mu\text{m}$  long, 65-85  $\mu\text{m}$  wide; anterior margin ever so slightly convex medially. Venter otherwise as in *L. elegans*, except that cuticle bears about 10 pairs of setae.

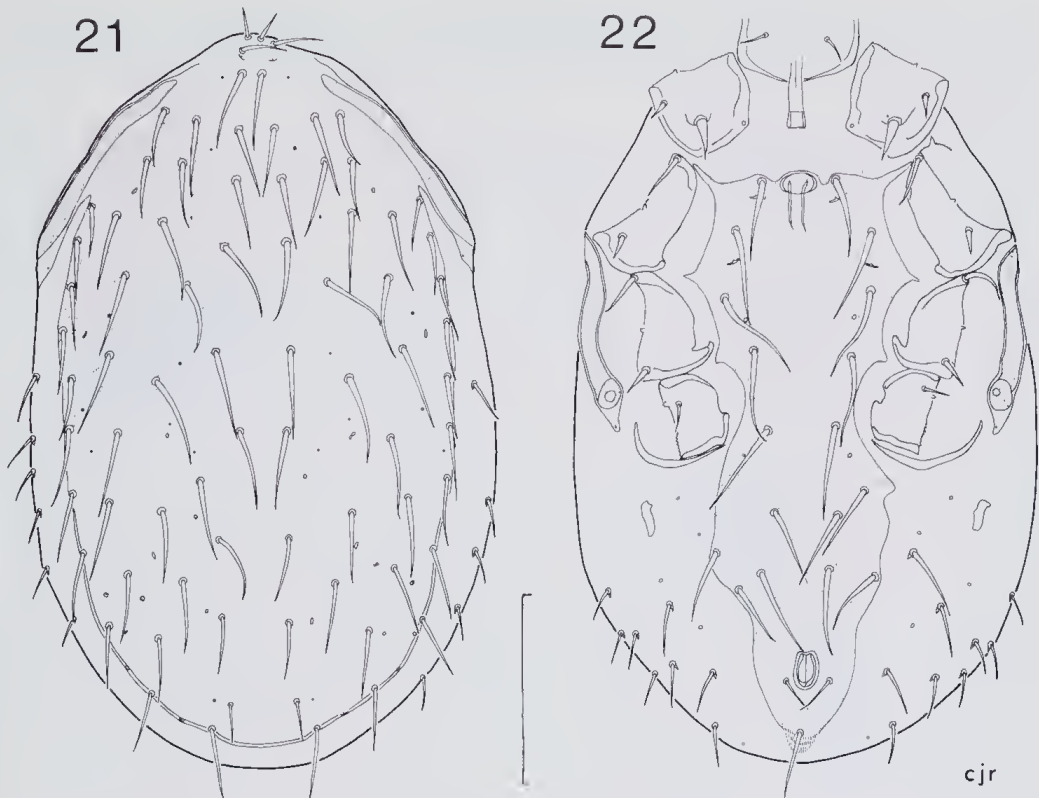
Leg setation as in *L. elegans*, except as follows. Coxa I with *av* a spur in shape of arrow-head, with short terminal filament that is almost invariably snapped off (as is case in *L. wasselli*). Tarsi II-III with *al*<sub>1</sub> strengthened, but still sharp-tipped.

Male (Figs 21-22): Chelicerae 105-110  $\mu\text{m}$  long, with spermatodactyl occupying 45% of length. Capitulum otherwise as in *L. elegans*.

Dorsal shield 360-375  $\mu\text{m}$  long, 200-210  $\mu\text{m}$  wide. Dorsum otherwise as in *L. elegans*.

Holovenral shield 305-320  $\mu\text{m}$  long, 95-105  $\mu\text{m}$  wide; ventral portion normally with five pairs of setae. Venter otherwise as in *L. elegans*, except that cuticle bears about eight pairs of setae.

Leg setation as in ♀, except that *pv* on coxae I-III is sharp-tipped.



**Figs 21-22:** *Laelaps synnomus* sp. nov. Idiosoma ♂ (dorsal and ventral, former with seta  $J_2$  absent on right-hand side, latter with setae on ventral portion of holoventral shield irregular on both sides, i.e. one absent on left-hand side and one free in adjacent cuticle on right-hand side).

Protonymph (**Figs 23-24**): Capitulum holotrichous; otherwise as in ♀. Chelicerae 80-90  $\mu\text{m}$  long.

Podonotal shield 170-190  $\mu\text{m}$  long, 145-155  $\mu\text{m}$  wide. Opisthonotal shield 75-90  $\mu\text{m}$  long, 115-130  $\mu\text{m}$  wide; anterior margin more strongly arched than in *L. elegans*. Dorsum otherwise as in *L. elegans*.

Sternal shield 100-115  $\mu\text{m}$  long, 75-85  $\mu\text{m}$  wide. Anal shield 55-65  $\mu\text{m}$  long, 40-45  $\mu\text{m}$  wide. Venter otherwise as in *L. elegans*.

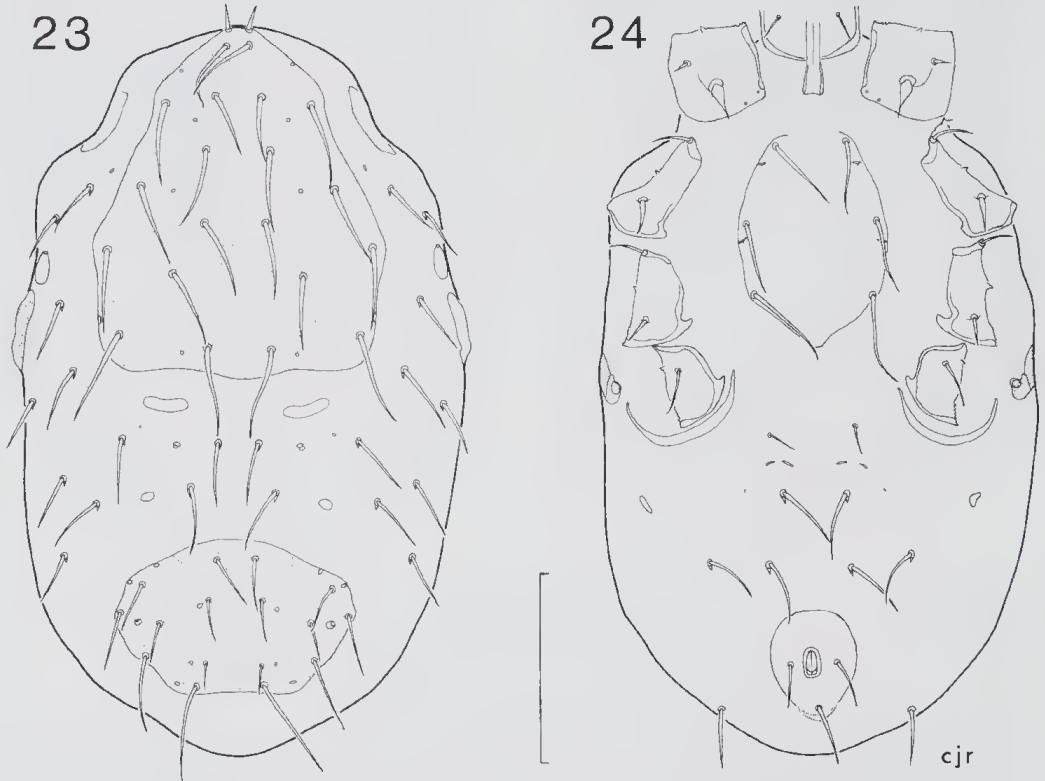
Legs holotrichous, with one exception: genu IV 1-4/0-1; otherwise as in ♂.

#### *Hosts and Localities*

On common rock rat, *Zyzomys argurus* (Thomas) (Rodentia: Muridae) (3100, 3105, 3119, 3122, 3138, 3146, 3155, 3156), Port Warrender, W.A., 28-31.X.1976 (holotype ♀, allotype ♂, 8 paratype ♀♀, 4 paratype ♂♂, 4 morphotype pn). On *Z. argurus* (2655), Napier Downs, W.A., 2.IX.1976 (1 ♀, not a type). On *Z. argurus* (2697, 2703, 2710), Mount Hart, W.A., 12, 14.IX.1976 (3 ♀♀, 1 pn,

not types). On *Z. argurus* (3060), Mitchell Plateau, W.A., 22.X.1976 (1 ♀, not a type). In WAM (including holotype 79/1505, and allotype 79/1508), FMNH, QIMR, CU.

On Tunney's rat, *Rattus tunneyi* (Thomas) (Muridae) (3114, 3127), Port Warrender, 29-30.X.1976 (1 ♀, 1 pn, not types). In WAM, FMNH.



Figs 23-24: *Laelaps synnomus* sp. nov. Idiosoma pn (dorsal and ventral).

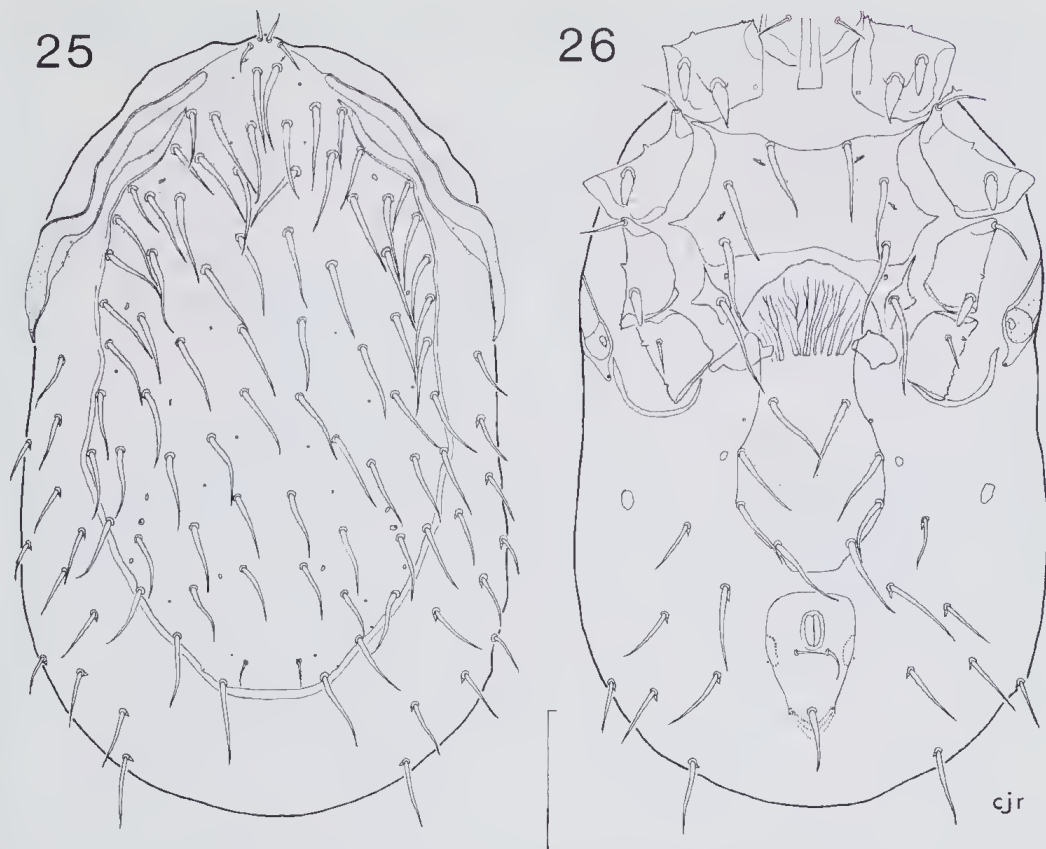
### *Laelaps parameces* sp. nov.

This new species also keys out near *L. wasselli*, but is at once separable by the differing outlines of all four major idiosomatal shields [the dorsal shield of *L. wasselli* was figured by Domrow (1963)]. Thus, the dorsal shield of the new species is tapered and truncate at the termen, the sternal excavated anteriorly, the genital extended posteriorly and the anal elongated.

The new specific name is the Greek adjective παραμηκης (of a longish shape), and refers to the dorsal shield.

Female (Figs 25-26): Chelicerae 135-140  $\mu\text{m}$  long, with digits occupying 22% of length; otherwise as in *L. synnomus*. Capitulum otherwise as in *L. elegans*, except that labrum is more slender, *i.e.* evenly tapering.





**Figs 25-26:** *Laelaps parameces* sp. nov. Idiosoma ♀ (dorsal and ventral).

Dorsal shield 445-480  $\mu\text{m}$  long, 235-255  $\mu\text{m}$  wide; shaped somewhat differently from that of *L. elegans*, i.e. parallel-sided, tapering to truncate termen, with paler marginal strip more pronounced (cf. *Laelaps* sp. nov. Domrow, in preparation, from *Pogonomys* spp. in Papua New Guinea). Dorsum otherwise as in *L. elegans*, except that some smaller pores on dorsal shield appear to be lacking.

Sternal shield 70-75  $\mu\text{m}$  long, 135-140  $\mu\text{m}$  wide; anterior margin shallowly excavated between *st*<sub>1</sub>. Genital shield 115-125  $\mu\text{m}$  long, 95-105  $\mu\text{m}$  wide. Anal shield 100-110  $\mu\text{m}$  long, 60-65  $\mu\text{m}$  wide, more elongate than in *L. elegans*; anterior margin weakly convex; *aa* falling well short of *pa*. Venter otherwise as in *L. elegans*.

Leg setation as in *L. synnomus*.

Male (**Figs 27-28**): Chelicerae 110  $\mu\text{m}$  long, with spermatodactyl occupying 40% of length. Capitulum otherwise as in *L. elegans*.

Dorsal shield 360-375  $\mu\text{m}$  long, 180-185  $\mu\text{m}$  wide. Dorsum otherwise as in  $\text{♀}$ , except that pale marginal strip on dorsal shield is less distinct and cuticle bears only about six pairs of setae.

Holoventral shield 315-335  $\mu\text{m}$  long, 85-90  $\mu\text{m}$  wide. Venter otherwise as in  $\text{♀}$ , except that cuticle bears only about six pairs of setae.

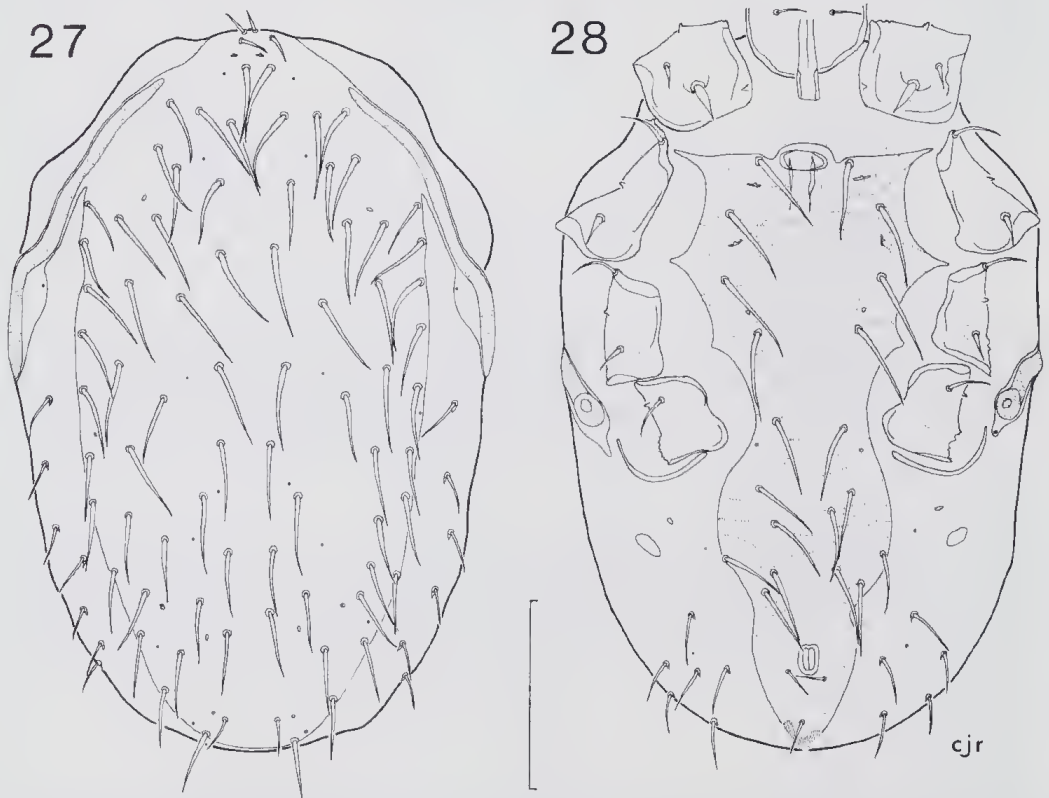
Leg setation as in  $\text{♀}$ , except that *pv* on coxae I-III is slightly attenuate distally.

Protonymph (Figs 29-30): Capitulum holotrichous; otherwise as in  $\text{♀}$ . Chelicerae 85-105  $\mu\text{m}$  long.

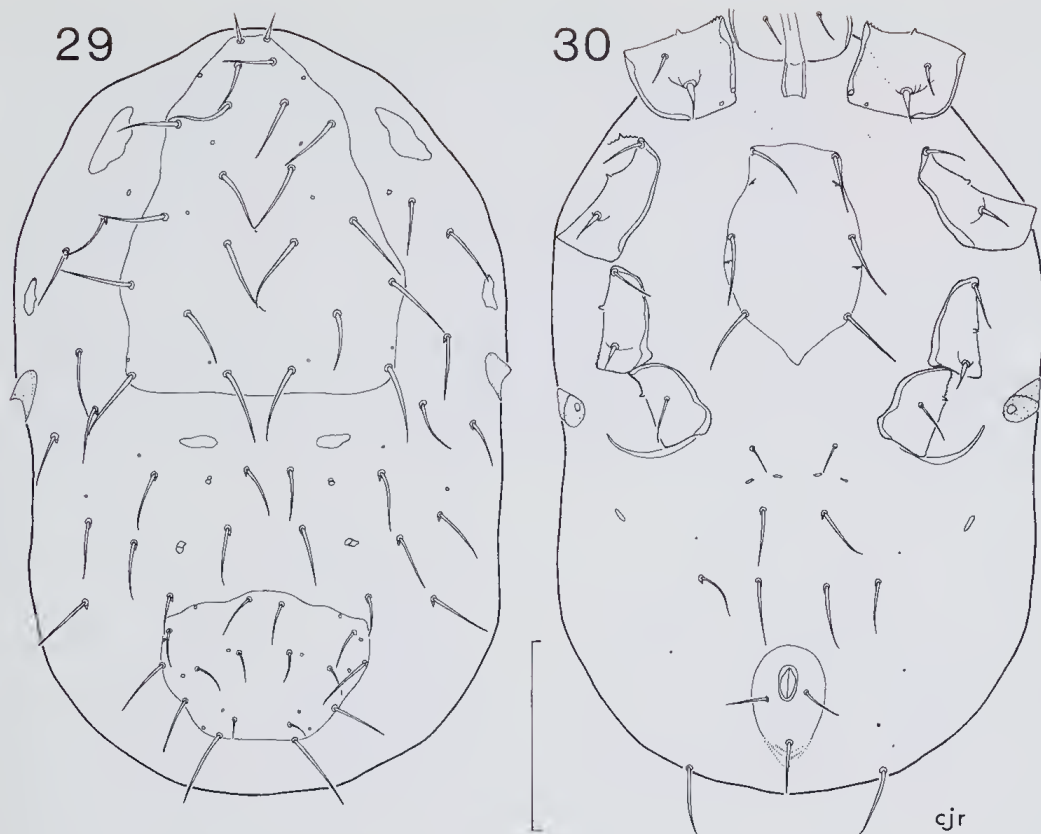
Podonotal shield 165-195  $\mu\text{m}$  long, 150-155  $\mu\text{m}$  wide. Opisthonotal shield 70-85  $\mu\text{m}$  long, 95-115  $\mu\text{m}$  wide. Dorsum otherwise as in *L. elegans*.

Sternal shield 110-120  $\mu\text{m}$  long, 70-75  $\mu\text{m}$  wide. Anal shield 60-70  $\mu\text{m}$  long, 40  $\mu\text{m}$  wide. Peritremes very short, barely reaching level of insertions of *pv* on coxae III. Venter otherwise as in *L. elegans*.

Legs holotrichous, with one exception: genu IV 1-4/0-1; otherwise as in  $\text{♂}$ , except that *pv* on coxae I-III is even more attenuate distally.



Figs 27-28: *Laelaps parameces* sp. nov. Idiosoma  $\text{♂}$  (dorsal and ventral, former with seta *px*<sub>2</sub> displaced on right-hand side).



Figs 29-30: *Laelaps parameces* sp. nov. Idiosoma pn (dorsal and ventral).

#### *Host and Locality*

On brush-tailed tree rat, *Conilurus penicillatus* (Gould) (Muridae) (3098, 3110, 3111, 3115, 3123, 3159), Port Warrender, W.A., 28, 29, 31.X.1976 (holotype ♀, allotype ♂, 28 paratype ♀♀, 4 paratype ♂♂, 7 morphotype pn). In WAM (including holotype 79/1511, and allotype 79/1512), FMNH QUMR, CU.

#### *Laelaps angiodes* sp. nov.

Although *L. angiodes* also keys out near *L. wasselli*, it more resembles the novelty just described (*L. parameces*) in the proportions of the four major idiosomatal shields. These effects, however, are exaggerated in *L. angiodes*, especially the tapering of the dorsal, and the excavation of the sternal, shields.

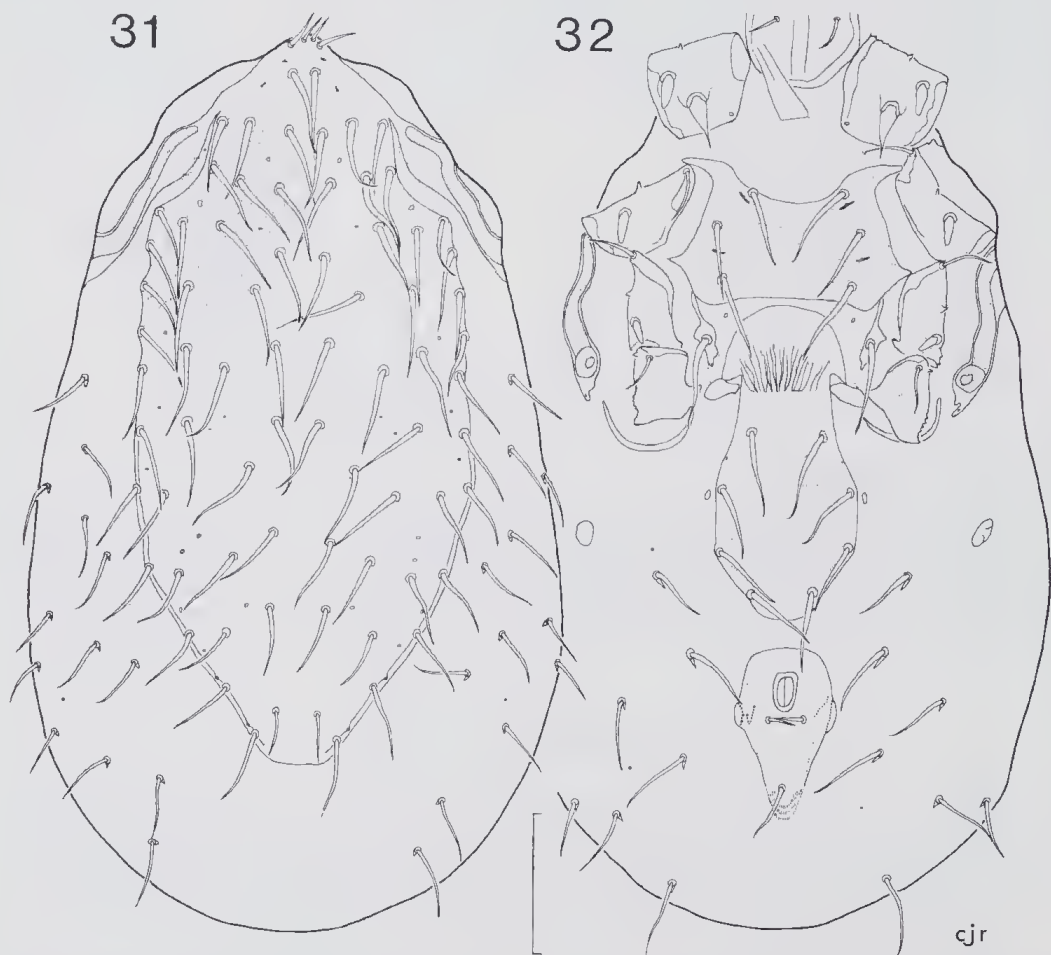
The normal host seems to be *Zyomys woodwardi*. The four specimens from *Rattus tunneyi*, *Z. argurus* and *Conilurus penicillatus* are best regarded as stragglers.

The new specific name is the Greek adjective αγγειωδης (like a vessel, hollow), and refers to the anterior margin of the sternal shield.

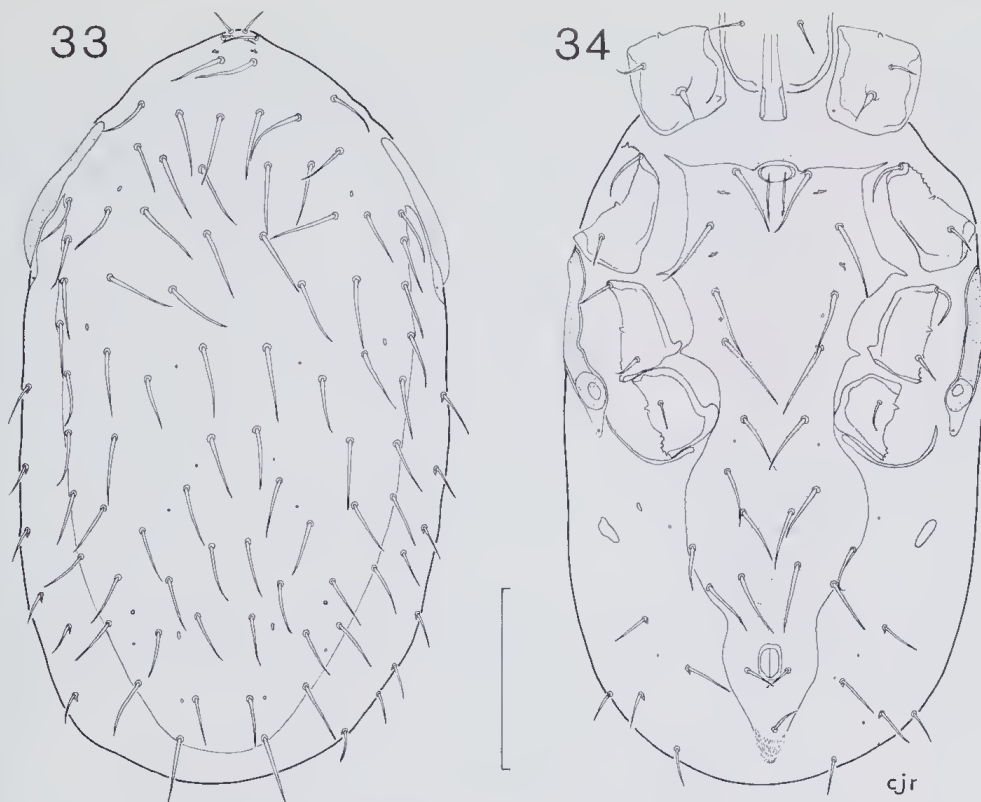
Female (Figs 31-32): Chelicerae 135-150  $\mu\text{m}$  long, with digits occupying 22% of length; otherwise as in *L. synnomus*. Capitulum otherwise as in *L. parameces*.

Dorsal shield 475-510  $\mu\text{m}$  long, 230-255  $\mu\text{m}$  wide; elongation, posterior tapering and truncation more exaggerated than in *L. parameces*. Dorsum otherwise as in *L. parameces*.

Sternal shield 60-70  $\mu\text{m}$  long, 130-135  $\mu\text{m}$  wide, as in *L. parameces*, except that anterior margin is more strongly excavated. Genital shield 125-135  $\mu\text{m}$  long, 95-105  $\mu\text{m}$  wide. Anal shield 115-125  $\mu\text{m}$  long, 60-65  $\mu\text{m}$  wide, a little more modified than in *L. parameces*. Venter otherwise as in *L. parameces*.



Figs 31-32: *Laelaps angiodes* sp. nov. Idiosoma ♀ (dorsal and ventral, former with seta  $px_2$  absent on left-hand side).



Figs 33-34: *Laelaps angiodes* sp. nov. Idiosoma ♂ (dorsal and ventral).

Leg setation as in *L. parameces*, except that *pv* on coxae I-III is rather more parallel-sided.

Male (Figs 33-34): Chelicerae 115  $\mu\text{m}$  long, with spermatodactyl occupying 37% of length. Capitulum otherwise as in *L. elegans*.

Dorsal shield 240  $\mu\text{m}$  long, 195  $\mu\text{m}$  wide. Dorsum otherwise as in *L. parameces*.

Holoventral shield 335  $\mu\text{m}$  long, 95  $\mu\text{m}$  wide. Venter otherwise as in *L. parameces*.

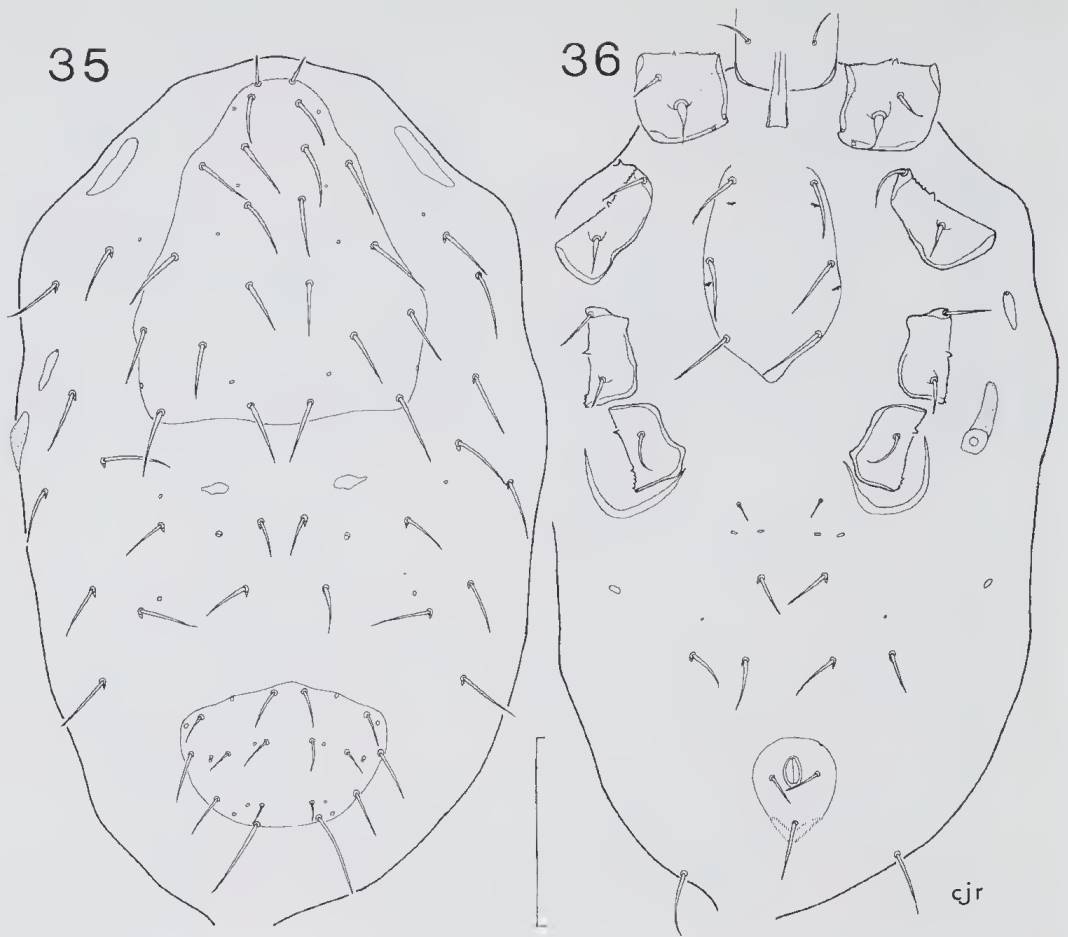
Leg setation as in ♀, except that *pv* on coxae I-III is virtually setiform.

Protonymph (Figs 35-36): Capitulum holotrichous; otherwise as in ♀. Chelicerae 90-105  $\mu\text{m}$  long.

Podonotal shield 170-185  $\mu\text{m}$  long, 140-150  $\mu\text{m}$  wide. Opisthonotal shield 70-80  $\mu\text{m}$  long, 95-105  $\mu\text{m}$  wide. Dorsum otherwise as in *L. elegans*.

Sternal shield *ca* 120  $\mu\text{m}$  long, 65-80  $\mu\text{m}$  wide. Anal shield 55-60  $\mu\text{m}$  long, 35-40  $\mu\text{m}$  wide. Venter otherwise as in *L. parameces*.

Legs holotrichous, with one exception: genu IV 1-4/0-1; otherwise as in ♂.



Figs 35-36: *Laelaps angiodes* sp. nov. Idiosoma pn (dorsal and ventral).

### *Hosts and Localities*

On Woodward's rock rat, *Zyzomys woodwardi* (Thomas) (Rodentia: Muridae) (3120, 3142, 3144), Port Warrender, W.A., 29-30.X.1976 (holotype ♀, allotype ♂, 39 paratype ♀♀, 9 morphotype pn). In WAM (including holotype 79/1521, and allotype 79/1522), FMNH, QIMR, CU.

On Tunney's rat, *Rattus tunneyi* (Thomas) (Muridae) (3116), Port Warrender, 29.X.1976 (1 ♂, 1 pn, not types). In WAM.

On common rock rat, *Zyzomys argurus* (Thomas) (3037), Mitchell Plateau, W.A., 20.X.1976 (1 pn, not a type). In WAM.

On brush-tailed tree rat *Conilurus penicillatus* (Gould) (Muridae) (3111), Port Warrender, 29.X.1976 (1 ♀, not a type). In WAM.

### *Laelaps aella* Domrow, 1973

This species was previously known from two closely related species of *Pseudomys* in Queensland, the Northern Territory and Western Australia: *P. gracilicaudatus* and *P. nanus* (Domrow 1979). The specimen from *Macroglossus lagochilus* is clearly a straggler.

#### *Hosts and Locality*

On western chestnut native mouse, *Pseudomys nanus* (Gould) (Rodentia: Muridae) (3004, 3007, 3025, 3045, 3046, 3048, 3055, 3062, 3064, 3091), Mitchell Plateau, W.A., 18, 19, 20, 21, 22, 25.X.1976 (18 ♀♀). In WAM, FMNH, QIMR, CU.

On Forrest's native mouse, *Pseudomys forresti* (Thomas) (3063), Mitchell Plateau, 22.X.1976 (1 ♀). In WAM.

On native mouse, *Pseudomys* sp. (3038, 3093), Mitchell Plateau, 20, 25.X.1976 (8 ♀♀). In WAM, FMNH.

On northern blossom bat, *Macroglossus lagochilus* Matschie (Chiroptera: Pteropodidae) (3020), Mitchell Plateau, 19.X.1976 (1 ♀). In WAM.

### *Laelaps rothschildi* Hirst, 1914

This species, though common on many species of *Melomys* and *Uromys* in New Guinea and north-east Australia (Domrow 1977, 1979), was previously unknown from Western Australia.

#### *Host and Locality*

On scale-tailed rat, *Melomys* sp. (Rodentia: Muridae) (3141, 3151), Port Warrender, W.A., 30, 31.X.1976 (28 ♀♀). In WAM, FMNH, QIMR, CU.

### *Laelaps pammorphus* Domrow, 1973

This species was previously known from two species of *Zyzomys* in Queensland, the Northern Territory and Western Australia: *Z. argurus* and *Z. woodwardi* (Domrow 1979). The specimens from rodents other than *Zyzomys* are best regarded as stragglers; those from bats certainly are.

#### *Hosts and Localities*

On common rock rat, *Zyzomys argurus* (Thomas) (Rodentia: Muridae) (2632, 2637, 2638, 2639, 2640, 2641, 2643, 2644, 2645, 2647, 2653, 2654, 2655, 2662, 2665, 2669), Napier Downs, W.A., 30, 31.VIII, 1, 2, 3, 4.IX.1976 (68 ♀♀,

21 ♂♂). On *Z. argurus* (2693, 2694, 2697, 2698, 2701, 2710, 2712), Mount Hart, W.A., 11, 12, 14.IX.1976 (12 ♀♀, 1 ♂). On *Z. argurus* (2721, 2726, 2733, 2734, 2736, 2737, 2738, 2792, 2793, 2794), Beverley Springs, W.A., 18, 19, 22.IX.1976 (43 ♀♀, 14 ♂♂). On *Z. argurus* (2802, 2803, 2804, 2810, 2812, 2814, 2816, 2817, 2818, 2834, 2837, 2851, 2852, 2854, 2857, 2864, 2885, 2912), Brooking Springs, W.A., 28, 29, 30.IX, 2, 4.X.1976 (83 ♀♀, 48 ♂♂). On *Z. argurus* (3015, 3037, 3052, 3053, 3060, 3083, 3084, 3087), Mitchell Plateau, W.A., 19, 20, 21, 22, 24.X.1976 (35 ♀♀, 9 ♂♂). On *Z. argurus* (3100, 3104, 3105, 3108, 3119, 3122, 3124, 3138, 3143, 3144, 3146, 3147, 3154, 3155, 3156, 3164, 3165), Port Warrender, W.A., 28, 29, 30, 31.X, 2.XI. 1976 (67 ♀♀, 18 ♂♂). In WAM, FMNH, QIMR, CU.

On Woodward's rock rat, *Zyzomys woodwardi* (Thomas) (3144), Port Warrender, 30.X.1976 (1 ♀). In WAM.

On Tunney's rat, *Rattus tunneyi* (Thomas) (Muridae) (3114), Port Warrender, 29.X.1976 (1 ♂). In WAM.

On brush-tailed tree rat, *Conilurus penicillatus* (Gould) (Muridae) (3149), Port Warrender, 31.X.1976 (1 ♀). In WAM.

On western chestnut native mouse, *Pseudomys nanus* (Gould) (Muridae) (3054), Mitchell Plateau, 21.X.1976 (1 ♀). In WAM.

On native mouse, *Pseudomys* sp. (3038), Mitchell Plateau, 20.X.1976 (2 ♀♀). In WAM, FMNH.

On scale-tailed rat, *Melomys* sp. (Muridae) (3141), Port Warrender, 30.X.1976 (2 ♀♀). In WAM.

On house mouse, *Mus musculus* Linnaeus (Muridae) (2808, 2841), Brooking Springs, 28, 29.IX.1976 (1 ♀, 1 ♂). In WAM.

On northern mastiff bat, *Tadarida jobensis* (Miller) (Chiroptera: Molossidae) (2727), Beverley Springs, 18.IX.1976 (1 ♀). In WAM.

On little bat, *Eptesicus pumilus* (Gray) (Chiroptera: Vespertilionidae) (2739), Beverley Springs, 19.IX.1976 (1 ♀). In WAM.

On black flying fox, *Pteropus alecto* Temminck (Chiroptera: Pteropodidae) (2805, -), Brooking Springs, 28, 29.IX.1976 (3 ♀♀, 2 ♂♂). In WAM, FMNH, QIMR, CU.

On northern blossom bat, *Macroglossus lagochilus* Matschie (Pteropodidae) (3013), Mitchell Plateau, 19.X.1976 (1 ♀, 1 ♂). In WAM.

### *Laelaps hapaloti* Hirst, 1931

This species, though common on the genus *Notomys* in the drier parts of Queensland, Victoria, South Australia and Central Australia (Domrow 1973),



was previously unknown from Western Australia. The deutonymph is newly described. It is a disappointment that the first mite I have seen from the rare *Notoryctes typhlops* is only a straggler.

Adult: Dorsal shield showing following individual variation, cf. Domrow (1963, 1973): from *N. alexis*, ♀ normal; one ♂ with  $z_6$  absent on one side, other ♂ with  $z_6$  and  $S_5$  absent on one (same) side; from *Notomys* sp., ♀ with  $z_6$  absent on one side; from *Notoryctes*, ♀ with  $z_6$  absent on one side, and  $z_6$  and  $s_4$  on other.

Deutonymph (Figs 37-38): Capitulum, as far as can be seen, as in ♀.



Fig. 37: *Laelaps hapaloti* Hirst. Idiosoma dn (dorsal).

Dorsal shield calculated to be 790  $\mu\text{m}$  long, 415  $\mu\text{m}$  wide; parallel-sided (uncinised), but tapered to short, transverse termen; surface with reticulate striae; hypotrichous (with 22 pairs of setae on podonotal portion,  $s_{1,2}$  and  $r_{2,4}$  actually free in adjacent cuticle; 15 on opisthonotal,  $px_{2,3}$  lacking), with at least some of 22 pairs of pores commonly seen in *Laelaps*, but, while two pairs in

front of  $S_{4-5}$  are distinct, it cannot be seen in this pale, freshly moulted specimen whether they are accompanied by "windows." Dorsal cuticle with many pairs of short setae.



Fig. 38: *Laelaps hapaloti* Hirst. Idiosoma dn (ventral).

Presternal area striate. Sternogenital shield elongate, 390  $\mu\text{m}$  long, 135  $\mu\text{m}$  wide; sides subparallel, irregular posteriorly; surface with reticulate striae; with usual four pairs of setae and three pairs of pores; genital setae and pores free in adjacent cuticle. Anal shield 90  $\mu\text{m}$  wide (length unavailable because cribrum turns onto dorsum). Ventral cuticle with many pairs of setae, longer midventrally and posteriorly. Venter otherwise as in  $\text{♀}$ , except that post-stigmatic pores are free in cuticle.

Legs as in  $\text{♀}$ , except that  $al_1$  on tarsi II-III is sharp-tipped.

### *Hosts and Localities*

On spinifex hopping mouse, *Notomys alexis* Thomas (Rodentia: Muridae) (M12964), Wanjarri Nature Reserve, W.A., 8.I.1975, P. Lambert (1 ♀, 2 ♂♂, 1 dn). In WAM.

On Mitchell's hopping mouse, *Notomys mitchellii* (M8155), Lake Bidby, W.A., 18.IV.1969, M. Hartley (1 ♀). In WAM.

On marsupial mole, *Notoryctes typhlops* (Stirling) (Marsupialia: Notoryctidae) (M7711), Warburton Range, W.A., 1968, T. Carr (1 ♀). In WAM.

### *Neolaelaps spinosus* (Berlese, 1910)

This species is widespread on bats of the genus *Pteropus* (Pteropodidae) in S.E. Asia and Australasia (Domrow 1961, 1973, Wilson 1967, Prasad 1974). The specimen is clearly a straggler, cf. Bhattacharyya (1971).

### *Host and Locality*

On grassland scale-tailed rat, *Melomys littoralis* Lönnberg (Muridae), Capsize Creek, 80 km S of Moreton Telegraph Office, Cape York Peninsula, Q., 19.VII.1964, K. Keith (1 ♀). In QIMR.

### *Trichosurolaelaps emanuelae* Domrow, 1958

These specimens, from the original host genus, are included for historical reasons. See also Domrow (1977).

### *Host and Locality*

On spiny bandicoot, *Echymipera* sp. (Marsupialia: Peramelidae) (13056), Stephansort (= Bogadjim), ex-German New Guinea, 25.V.1904, P. Preuss (1 ♀, 1 ♂). In MNK.

### *Trichosurolaelaps marra* Domrow, 1972b

These specimens, from one of the original hosts, are included for historical reasons. See also Domrow (1977). Immatures were previously unknown.

Deutonymph: Capitulum as in ♀, with fully developed chelicerae.

Dorsal shield 435 µm long, 230 µm wide, not incised laterally between podonotal and opisthonotal portions; texture not wholly clear, but with some reticulate striae vertically, humerally and posterolaterally; setation as in ♀,

but  $s_1$ ,  $r_{2.5}$  and  $s_6$  free in adjacent cuticle. Dorsal cuticle with about 16 pairs of setae, all bladed, except one longer pair subposteriorly.

Sternogenital complex as in *T. crassipes* Womersley, see Domrow (1979); measurements unavailable because of fracture. Venter otherwise as in ♀, except as follows. Ventral cuticle with about 10 pairs of slightly bladed setae. Peritremes as in ♂.

Legs predicting those of ♀.

Protonymph: Capitulum with palpal trochanter-genu holotrichous (*i.e.* 1.4.5, *cf.* hypotrichous 2.4.5 in dn).

Dorsum as in *T. crassipes*, granted setae on opisthonotal cuticle are 6.5 in one specimen and 5.5 in other (*cf.* holotrichous 6.6). Podonotal shield 250 µm long, 200 µm wide. Opisthonotal shield *ca* 125 µm long, 60 µm wide.

Venter as in *T. crassipes*.

Leg setation as in *T. crassipes*.

#### *Host and Locality*

On sugar glider, *Petaurus breviceps* Waterhouse (Marsupialia: Petauridae) (T663), Australia, 29.XI.1913, Vosseler (1 ♂, 1 dn, 2 pn). In ZMH, QIMR.

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